THE MOTOR AGE

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MOTOR-CARRIAGE DESIGN

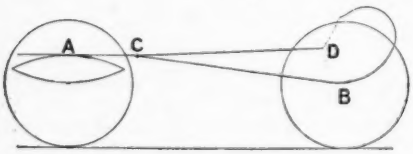
AN AUTHORITY WHO HAS INVESTIGATED THE SUBJECT THOROUGHLY GIVES HIS IDEAS AS TO THE PROPER CONSTRUCTION OF RUNNING GEAR FOR MOTOR-VEHICLES

At a recent meeting of the Cycle Engineers' Institute at Coventry, Eng., an association not only of cycle engineers, as the name would indicate, but of automobile engineers as well, Henry Sturmey gave a description of the running gear of a motor-vehicle which he announced he intended to have built for himself soon. Mr. Sturmey is a close student of the mechanical features of the motor business, being editor of one of the leading British papers devoted to its interests and for many years the editor of the acknowledged leader in cycle literature. During the past season he made a tour of the United States, calling on the principal makers and experimenters in the automobile business.

The ideas which he explained contain little of novelty but are doubtless the outcome of his extended knowledge of what is best in the way of motor vehicle construction. Designs to accomplish the same purposes have frequently been shown. One which is the same in principle and which also combines the driving of the vehicle by a single wheel which shares the weight with the other wheels is shown in the present issue of the Motor Age in the description of the vehicle of B. C. Hicks of Chicago. It is more than likely that time will demon-

strate that the general plan advanced by Mr. Sturmey, is the most practical for light autos.

During the course of his remarks Mr. Sturmey said that he did not favor the motor being placed at the back, but in front, where it would get all the air possible, and be out of the dust, besides being more under the eye of the driver should anything go wrong. With regard to transmission he believed in the chain, but it must not be placed where the chains were usually placed, where they caught the maximum amount of mud and dust from the wheels. The chain on a light car should be placed in the center. Further, he did not believe the right



place for the motor was in rigid connection with the driving wheels. In a tricycle or quadricycle that was about the only place in which they could put it, so they were obliged to have it there; but in a carriage they were not obliged to have it there.

It might be replied that a motor on a tricycle rigidly attached to the driving axle without any springs stood very well. It did, but he thought it would stand better if it were put somewhere else. That was what he should certainly advocate for a light four-wheeled car. There were other advantages to be gained by that. They could design their vehicle to give great comfort to the occupants, and he would sketch them a car, in which these points would be embodied. He then drew on the blackboard an outline of such a car as he proposed.

In explanation of the drawing, he proceeded: If B is taken as the driving axle, there is a rigid axle just the same as on a tricycle axle. He did not see why they should not keep that. It gave a great deal of simplicity, and made the work of the transmission gear very much easier. The motor, as he said just now, ought to be in front, and it ought also to be spring supported. Therefore, upon the front axle he put springs in the usual way. He put his motor at A, but he carried it upon a perfectly rigid frame A B.. Now, that got them over all the difficulty of radius rods, and other such like abominations. They had a rigid central drive on to balance gear. As it would be uncomfortable to attach the body to and sit upon a rigid frame, at the back he would hinge a frame at C to carry the body. Of course, the seat might be of any form, and he supported it at the end D by cee springs with straps, which could be adjusted to the weight of the rider, and to give the most comfortable angle at the seat.

He was inclined to think a carriage on these lines could not only be built very lightly, very simply, and very cheaply, but that it would give a good many more advantages, and a great deal more comfort than was to be obtained from most carriages today. Undoubtedly lightness was a great thing, provided that quality were accompanied by sufficient strength. Very few cars in England weighed under 675 pounds.

AUTOS DEFY THE SNOW

Boston, Jan. 6.—Everybody waited with interest for the first tussle of the electric cabs with the snow. There has been much prejudice here since last winter against horseless vehicles when confronted with a snow storm, because one of R. H. White's delivery wagons was stalled one day last winter for several hours on Winter Street, a target for the jibes of the conservatives. The first snow this winter fell this week to the depth of eight inches, during a very cold period. Yet the "lead cabs" triumphed and were the only "real things" until the street railroad company cleared the streets, as required by the terms of its franchise.

The horse cabbies thought they "had the laugh" on the "doughnut wagons,"

as they facetiously term the new cabs, but while their horses floundered about in the snow, the electric cabs whizzed merrily about gathering in the half dollars. As soon as Superintendent Neftel saw he had cold weather to contend with, he sent out only the broughams, which are closed. Each of the driving wheels was fitted with four chains, about ¾-inch in diameter, fastened across the tread of the tires and held in place with bolts passing through the steel flanges. These gave the necessary grip on the snow.

Only one of the broughams was stalled during the storm, and this happened because the driver did not watch his meters. The drivers were instructed to return to the stable for fresh battery after every four or five trips. Like the electric cars, the cabs had to use more current, but they demonstrated that they could be used in a snow storm, and the object lesson is not likely to be forgotten.

The two electric runabouts in use by the Edison Electric Illuminating Co. worked satisfactorily all through the storm. The National Biscuit Co.'s electric delivery wagon was on duty as usual and gave its usual satisfactory service. The electric van used by Cobb, Aldrich & Co., the largest horseless vehicle in use in Boston, made its usual trips, one of them being a round trip of eight miles to Dorchester and return.

Neither of the city's runabouts was in use, there being no call for them. The city's Stanley steam wagon had a novel experience during the extreme cold preceding the storm. It was left standing for some time with the fire down and the water in the tank froze. It was thawed out without much difficulty, but Driver Jones was accused by his confreres of city hall of trying to manufacture hot ice.

The Boston Transit Co., to which has recently been granted permission to operate lines of automobile omnibuses in the city, has been completely reorganized, owing in part to the failure of the Globe National Bank of this city, with whose interests two of its former directors were connected. Colonel Albert A. Pope of the Columbia & Electric Vehicle Co., who was instrumental in the formation of the Boston Transit Co., has retired from the company in an active capacity. It now has Oliver Ames as president, vice Benjamin D. Hyde, who is on the board of directors, however. Thomas K. Cummins, Jr., who is treasurer of the New England Electric Vehicle Co., is treasurer and clerk of the Transit company. On the new board of directors are Hon. George von L. Meyer, president of the N. E. E. V. Co.; Charles L. Edgar, Frederick A. Gilbert and Francis R. Hart, all members of the board of directors of the N. E. E. V. T. Co.

Mr. Edgar is vice-president of the New England company also and this close personal alliance is not likely to cause any friction between the two transportation companies, one using buses and the other cabs. The two companies, however, are wholly independent organizations, although the buses will be stored, charged and repaired at the cab company's stable, 541 Tremont Street.

Colonel Pope has within a day or two been elected to the board of directors of the New England company, in place of Abner J. Tower, who resigned because of illness. The colonel is therefore a member of both the New York and Boston electric vehicle companies and is really the moving spirit behind it all.

The names of ex-president Charles H. Cole of the Globe National Bank, his associate, William H. Coolidge, and G. Henry Whitcomb appeared in the original list of directors of the Boston Transit Co., but certain of the present officers say that they have no connection whatever with the company now.

The American Roller Bearing Co. has orders ahead to keep the factory running for four months at its highest capacity. The roller bearing as used by the company has met with great favor from users of heavy vehicles, as well as light ones, and all the electric cabs and heavy vehicles turned out by the Electric Vehicle Company are to be fitted with roller bearings. It is a gigantic task to equip them all, but the A. R. B. company proposes to do it as soon as possible. Practical use has demonstrated to the company that its bearings, used without cages, meet fully all the requirements of the heaviest service.

ENGLISH BALANCED ENGINE

BENNETT & THOMAS MOTOR IN WHICH BOTH MOVING PARTS AND EXPLOSIVE IMPULSES ARE BALANCED, DESCRIBED AND REASONS FOR CONSTRUCTION ANALYZED

The British motor manufacturers have, with few exceptions, been content, says the Automotor, to copy continental designs in their motors. This ignoble disposition has been encouraged by a somewhat indiscriminating portion of the automobile public which has seen or discovered points of excellence in Continental models that have never been apparent to us. Indeed, the best Continental models are but very imperfect machines from the scientific engineers' standpoint, and will, in a few years' time be, as we have on many previous occasions remarked, hopelessly obsolete and fit only for "scrap"—an observation for the benefit of, and doubtless comforting to those who have invested money in companies working under foreign patents, instead of encouraging British makers.

Poor Continental Designs

The gasoline motor in its typical French or German form is an exceedingly crude thing—outraging in its design many of the canons of sound engineering, but now that it has been taken up by British engineers, radical alterations in design have been made, and in the Lancaster and one or two other motors we have an almost perfectly balanced engine —a result that our Continental friends, so far as we know, have not yet attained. In the Bennett-Thomas motor which we are about to describe, we find some equally excellent improvements. The objects of the inventors have been to eliminate vibration and noise and to secure smoothness and quiet in running, together with simplicity in general construction.

How to Prevent Vibration

To prevent an explosive engine from vibrating, it is not only necessary to perfectly balance all moving parts, but also to balance the explosive impulses. It is a well known law of mechanics that "action and reaction are equal and opposite." When firing a gun the explosive force tends to propel it in the opposite direction to the projectile. The same action applies to the explosive engine; the force of the impulse tends to throw the cylinder and bed in the opposite way to that which propels the piston, and to cause it to kick or vibrate, imparting the motion to the carriage or launch in which it is fixed. Now, if two cylinders be tied together with forward ends towards each other and opposite, an equal explosion taking place in each cylinder simultaneously, moving the pistons to meet each other, there will obviously be no kick or reaction of the cylinders and body of engine, because the impulse in one will be counteracted by the impulse of the other, but the impulses must be equal and take place exactly together.

A Successful Solution

Messrs. Bennett & Thomas have endeavored, and successfully we think, to embody these principles in their motor by causing one impulse to act upon two pistons in two cylinders placed opposite each other.

A general plan of the motor is shown in Fig. 1 while Fig. 2 shows a part middle sectional elevation, Fig. 3 a side elevation with valve gear, Fig. 4 an end view and Fig. 55 a section of valve.

Description of Motor

The motor is horizontal and consists of two cylinders, a and a1, placed nearly opposite each other (see Fig. 1). The crank shaft, b, has two cranks c, c1, set at an angle of 180 degrees. The cylinders communicate with each other by one common combustion chamber, d, with passages, p. p1, leading to the exhaust valve, e, and the feed valve, f (see Fig. 3). This common combustion chamber curves close to the cylinders and communicates with them by the passages, q, q1 (see Fig. 1). The pistons at the back end of their strokes are close to the cylinder covers with a slight clearance, so that

when the explosive charge is compressed, practically the whole of it is in the chamber, d, therefore, when ignited it will affect both pistons equally and simultaneously no matter what the strength of the charge may be. All the moving parts are well balanced in an engine of this type, the two pistons, two connecting rods and two cranks being of equal weight. The crank chamber is closed air tight by the lid, h (see Fig. 4), screwed glands are fitted to main bearings and packed to keep out dust and prevent leakage of oil used for lubricating connecting rod ends and pistons.

Valves in Constant Contact.

In order to make an internal combustion motor work quietly it is necessary to have a valve gear in which all the moving parts are in constant contact with each other; such is not the case where mushroom or tappet valve are used. They

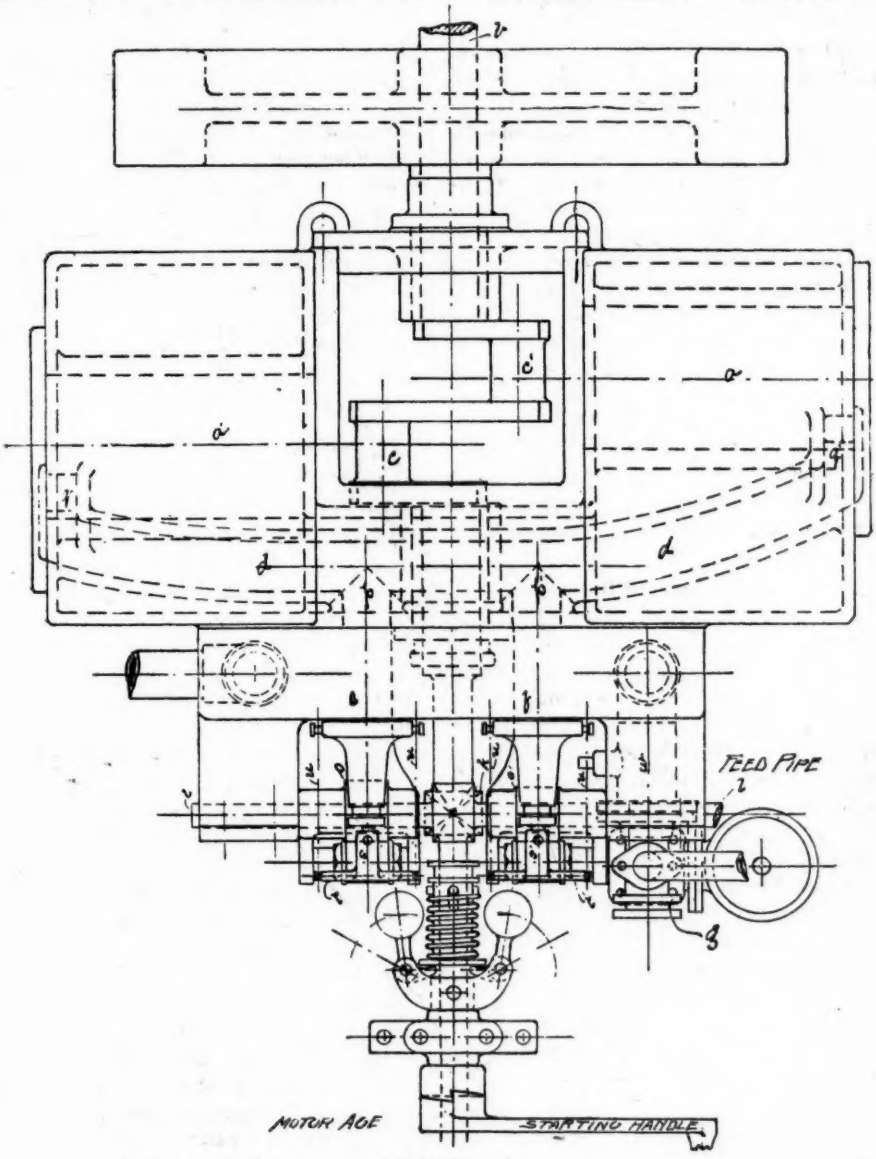


FIGURE 1.

make a noise when the valve is raised, by the lever tapping the end of the valve stock, and again when the valve is forced

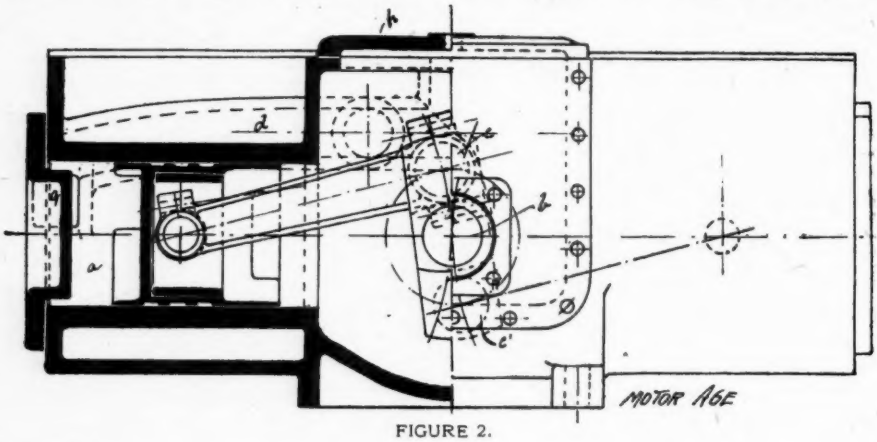


FIGURE 2.

back on its seat. This has been overcome by using piston valves, but in these valves special means must be adopted to prevent them leaking while compression and while explosion are taking place.

The valves are both worked mechanically by cams, o, o1, keyed to the cam shaft, i, which is rotated by the main shaft by means of the two to one screw gear, (see Fig. 3). An enlarged view of one of the valves is shown in Fig. 5. They consist of a piston, 1, valve stalk, 2, and broad piston ring, 3. The valve stalk works through a long guide and stuffing box. The cam and lever for reciprocating the valve is shown in Fig. 4, the lever, l, has its fulcrum at m, the

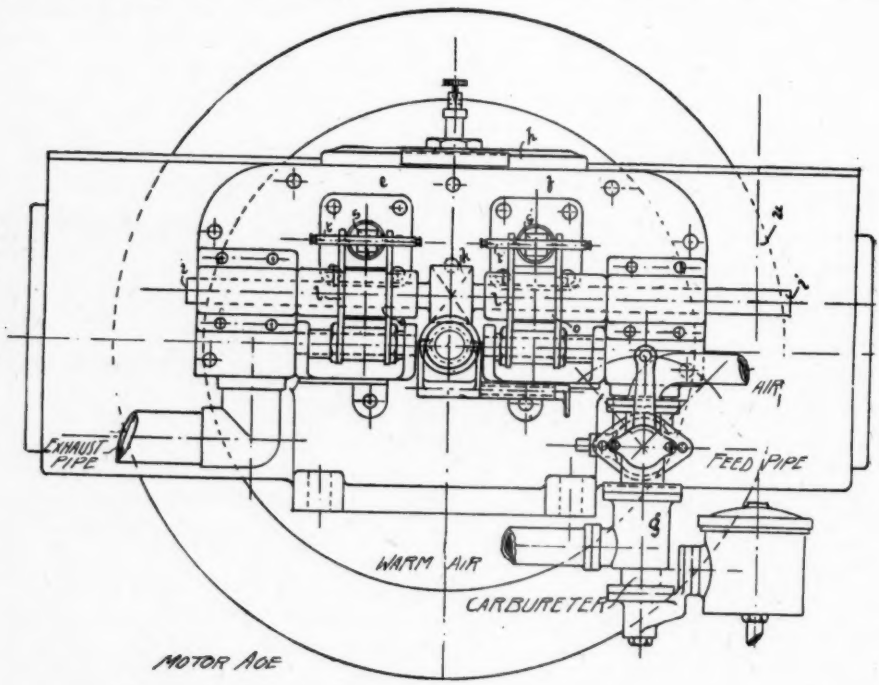


FIGURE 3.

roller, n, is kept constantly rolling on the cams, o, o1. These shackles have cross bars, t (see Fig. 1), to which spiral tension springs are attached to bring the

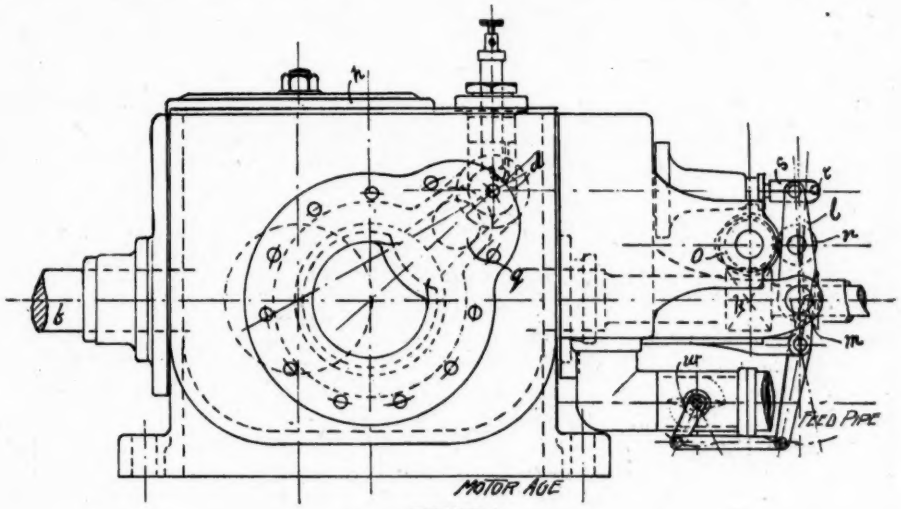


FIGURE 4.

valves back to their respective ports and to keep the rollers on the cams. It will be seen that there can be but very little noise from the valve gear, all motion being sliding and rolling, and all the parts being in constant contact with each other.

Novelty in Construction

The chief novelty in these piston valves is the broad piston ring, 3 (see Fig. 5); it is made to spring lightly against its cylinder walls and the pressure of the compression and explosion is allowed free way through the holes, 4, to both sides of piston to keep it in equilibrium, and behind the ring, 3, to keep it tight against the walls and so prevent leakage. The ring, 3, is split and the split is kept on a wide port bar by means of a glut. The angular opening of the valve port is the whole circumference of the valve minus this port bar; the travel of the valve and port opening is shown in Fig. 5. It will be seen by the drawings that the valves are easily gotten at by unbolting the flange of the guide from the body of the valve box and drawing it all away complete, the shackles, s, s1, being made to hook on or off the pins in the levers, I, I1.

The cylinders and valves are water-jacketed, as it is advisable that this form of valve should be kept cool.

Minor Features

The carburettor is the improved Long-uemare, fitted on the feed pipe as shown at 5 (see Fig. 5). Governing is effected by a common throttle valve, w (see Fig. 4), in the feed pipe and a centrifugal governor on the main shaft prolonged, which is a good arrangement for motor

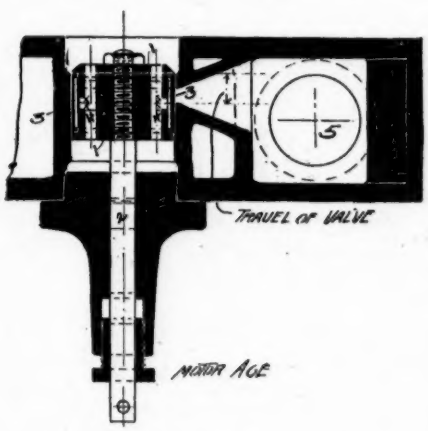


Figure 5.

vehicles where quietness is of the utmost importance, being at once noiseless, effective and simple.

The drawings refer to a six horse power motor running at 700 revolutions a

minute. The inventors have a motor of this type propelling a small launch giving 3 1-2 brake horse power at 650 revolutions a minute. It has been at work eight months, giving excellent results. It uses three pints of gasoline an hour and starts very easily.

The advantages claimed are absence of vibration, noiselessness, smooth running and simplicity.

NEW YORK ELECTRIC OMNIBUS

The accompanying illustration shows the new electric 'bus which received its first trial during the past week on Fifth avenue, New York. In the test it made the trip from Eighty-eighth Street and Fifth Avenue to the Washington Arch. The trip was made in a little less time than that occupied by the horse-drawn stages.

There are accommodations for eight passengers inside and four outside, one of the latter on the seat with the driver.

The windows are arranged to drop and are equipped with "anti-rattlers." There are three electric lights in the roof, two on the sides and one portable.

The weight of the vehicle, empty, is 5,500 pounds and the rate of speed at which it can travel on the level is nine miles per hour, with an ability to travel twenty-five miles on one full charge of the battery. The battery consists of forty-four cells disposed in four trays, two under each seat, and weighs 1,500 pounds.

USES A SINGLE DRIVING WHEEL

B. C. HICKS, A CHICAGOAN, CONSTRUCTS A VEHICLE WITH A SINGLE DRIVING WHEEL IN THE CENTER OF THE VEHICLE—HIS REASONS FOR THIS METHOD OF CONSTRUCTION

The motor-vehicle wheel problem, which has worried so many constructors, has received attention from a Chicago man, B. C. Hicks, who has attempted to solve the problem by relieving the wheels of their too great burdens rather than by devising a stronger form of construction. In discussing the matter, Mr. Hicks talked entertainingly on the following lines:

The Wheel Problem

The wheel problem is harder to solve in the motor vehicle than in the ordinary vehicle on account of the transmission of power. It is owing to this transmission, that the direct-spoked wheel has come in for so many criticisms at the hands of scientific men in the trade, and the tangent spoked wheel recommended in its stead; the construction of the metal spoked tangent wheel is such as to carry the strains placed upon it in driving in a far safer manner than the direct wood spoke and at the same time it looks lighter.

So long as the driving is accomplished through the wheels there will be trouble with them; it therefore seems necessary to utilize some other method of transmitting power that will equalize the enormous strains incident to propelling a vehicle.

To Reduce Strains

The desirability of reducing strains in the wheels of the automobile is the same as in locomotive building, where the enormous weight carried must be equalized as much as possible to get the best results; no more weight is applied to the drivers than is needed—to give the engine its requisite traction, hence other wheels are provided. In this way the bind and consequent hard wear on the working parts is greatly lessened and the life of the engine, as a whole, is lengthened.

Lateral Strains

Lateral strains play quite as important a part as does the driving through the wheels, in the deterioration of the vehicle; but, unlike the light horse drawn vehicle, they cannot be so easily provided against. The motor vehicle must of necessity be heavy and where their weight there must also be strength; and where the combination exists in abundance no great mechanical allowance can be made for torsional strains and, consequently, some parts of the construction are called upon to withstand more than their share of the work, with the result they deteriorate rapidly, become weak and finally give out altogether.

Remedies Tried

To eliminate lateral and torsional strains so far as possible a number of ideas have been worked out under the direction of mechanically inclined constructors, that have, in a manner, served their purpose but have still left much to be desired. The single traction motor-wheel with which an eastern vehicle is equipped, is a move in this direction. In that machine the motive power is electricity, the motor being securely built to the front fork of a tricycle.

Allows Freedom of Motion

This construction allows a greater freedom of motion in the frame but throws additional strains upon the single wheel and gear in the forward part of the vehicle, which should, if possible, be avoided. It allows an oscillating movement to take place when the vehicle is passing over rough roads, but when the front wheel strikes a hole or an obstruction in the roadway the shock is more acute and is harder for the vehicle to overcome than it would be were the wheel of larger size or the weight carried on two wheels some distance apart.

To Minimize Vibration

This construction has been tried in comparatively small machines and in full sized delivery wagons as well, but the

action is the same in each instance, except that it is magnified in the heavier machine.

One of the secrets of an easy running machine is the manner in which it is capable of getting over uneven surfaces with as little vibration as possible. The rapid transferring of a heavy load from

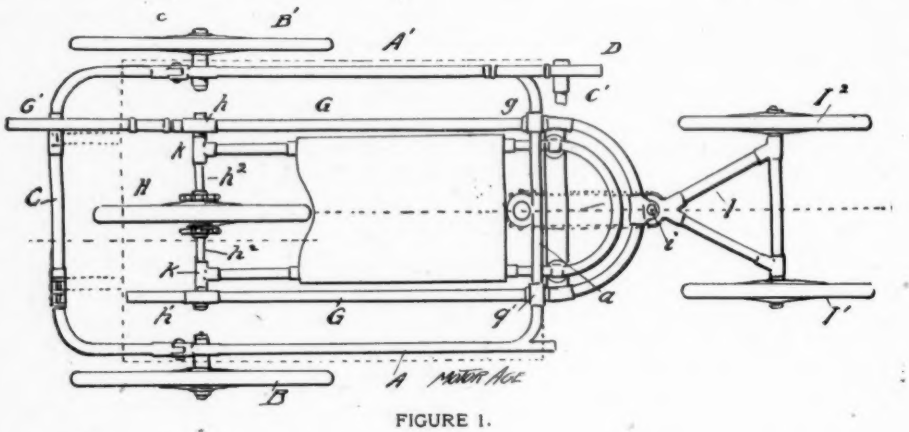


FIGURE 1.

one position to another, as is constantly being done in moving vehicles, demands an enormous amount of energy. Energy thus consumed creates a wear and tear on the working parts that soon makes itself known through the manner in which the vehicle operates. It retards speed and it reduces the efficiency of the vehicle. This is one reason why every machine built by experienced constructors is mounted on springs capable of relieving the body, and, if possible, the delicate working parts from the jolt and jar consequent upon rapid motion over rough and uneven surfaces.

Vibration Causes Strains

When a four-wheeled vehicle carries a load, that load is thrown first in one direction, then in another, in accordance with the movements of the vehicle, consequently throwing heavy strains at times on some part that may not be capable of sustaining it and which as a matter of fact should not be called upon to take it. In the three-wheeler it is the same, but vibration is aggravated by the smallness of the front wheel, especially if it is the driver and is heavy. Small wheels are more sensitive to shock than are those of large diameter, hence it is better to use larger wheels wherever possible.

Theories Carried Out

To carry out his theory, as summarized in the foregoing, Mr. Hicks, to equalize the weight, introduces a fifth wheel and mounts it on a peculiar form of frame, between the two rear wheels that ordinarily do the driving. In this construction, however, the driving is accomplished by means of the fifth wheel, the transmission being by chains running from a counter-shaft under the rear seat of the vehicle. This counter shaft is, in turn, connected with the engine shaft by another chain.

Adjustment of Weight

The rear axle upon which the regular wheels are mounted is bent forward in the center and carries the connections by means of which it is movably attached to the main frame. To the axle, near where the wheels are attached, the body springs are adjustably clamped. This connection allows the shaft to swing in clamps, thus permitting the springs to be moved either forward or back according to the weight carried in the body and making it possible to throw greater or less weight on the driving wheel as desired. As the driver is rigidly connected to the main frame and the main frame is hinged at the front axle, it will be seen that it carries practically all the weight of the rig with the exception of what little passes

through the springs to the rear wheels in the ordinary manner.

Driver is Independent

This permits the driver and rear wheels to move either in the same or opposite directions and still do the work required of them satisfactorily. Where the road is uneven, the driver can sink into depressions and at other times rise above the plane of the two rear wheels without interfering in any manner with the propulsion of the vehicle. During the time the driver is lower than the rear wheels more weight is thrown on the springs than is the case where it is above the road level; this makes the movement of the body of the vehicle comparatively small. The springs absorb the vibration and allow the driver and two rear wheels to rise or sink in opposite directions, while they hold the body momentarily in its position until the three wheels come back to an approximately common plane.

Latitude of Movement

The radius action given the rear wheels by their being mounted on a hinged axle and the driving wheel being fulcrumed at the front axle makes it possible for the fifth or driving wheel to sink a foot or more, or the rear wheels to rise a foot or more, and still fulfil their functions satisfactorily without the consequent jolting and jarring that would naturally arise from such a movement in an ordinary vehicle, where no equalization is provided and in which the body would be forced to rise or fall with every rise or fall of the rear wheels.

Similar to a Tricycle

In Mr. Hicks' vehicle the driving wheels and the front wheels (with frame) constitute practically, a rear driven tricycle, the front of which is mounted on ordinary light springs. On each side of the rear driver a large wheel is mounted to work independently of the driver but attached to the body by springs.

"This," said Mr. Hicks, "will make it possible for the vehicle to negotiate uneven surfaces with no violent movement of the body. It also permits the use of light wheels instead of exceedingly heavy ones, as would be necessary should the entire load be carried and the driving done through the same ones."

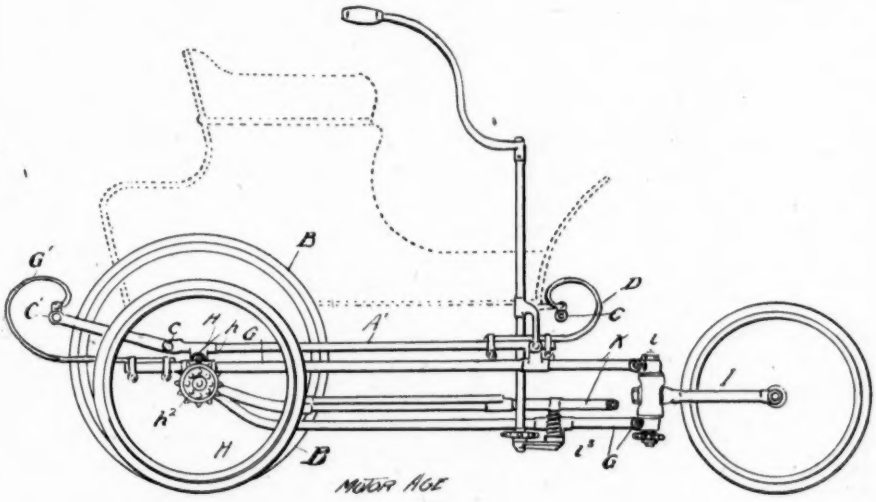


FIGURE 2.

Driver Carries Most Weight

The complete vehicle weighs about 1,000 pounds and of this about half is carried upon the driver. Thus the weight sustained by the other four wheels is reduced to approximately 500 pounds, allowing light wheels and tires to be used. The springs are adjustable on the hinged axle so that the tractive power of the driver may be made greater or less, according to the requirements, for, as the

axle is allowed greater freedom in its upward movement, by the springs being set forward of the hub, greater weight is thrown on the driver.

Description of Parts

In the accompanying illustrations, Fig. 1 shows a plan of the running gear of the vehicle and Fig. 2 a vertical section on line 2 of Fig. 1.

The bars A and A1 carry the supporting wheels B and B1 and are connected at their forward ends by the cross bar a, to which is hinged the U-shaped portion G G to which a single driving wheel H is rotatably attached by the bearings h and h1 and the axle h2. The rear portion of the bars A and A1 are connected by the curved bar C which is hinged at the points c c. This bar C is attached to the curled springs G1 (see Fig. 2) which are also attached to the U-shaped frame G. It will be seen that the amount of weight carried by the driving wheel H depends on the strength and tension of the springs G1. The supplementary frame K carries the platform K1 to support the motor and is journaled on the axle h2 at k k. At its forward end it is supported by the helical springs k2 (see Fig. 2) to give a yielding support to the motor.

The forward ends of the bars A A1 are provided with curled springs D which are connected by the bar C1. The carriage body is carried on the bars C at the rear end of C1 at the front.

Steering Gear

The steering wheels I1 and I2 are carried by the triangular framework I which is pivoted to the frame G by the stud i which is bored for an extension i2 of the V-shaped frame I to permit of the wheels accommodating themselves to the inequalities of the road.

The steering is accomplished by means of a lever, sprocket wheels and chain as may be seen by referring to the cuts.

In the carriage which Mr. Hicks is at present just completing, he has abandoned the steering gear shown in the illustrations, which are taken from the patent specifications. Further details of the vehicle will be given later, when it has been further tested.

CONQUEST OF THE WORLD

A none too welcome Christmas present has been presented to Europe in the form of a lengthy contribution to a French periodical by George Weulersse on American expansion—commercial, rather than military expansion. His article is a careful, economic study and is pased on thoroughly digested facts and figures worked out to a logical conclusion—not on mere theories.

The perusal of what he says should act as a powerful stimulus to the individuals on whom, as a whole, America must depend for the supremacy which Mr. Weulersse predicts. It is a confirmation of the correctness of the self confidence of our countrymen, on which the author lays much stress, and a recognition of our advantages, both geographical and mental, from a source whence it might be least expected. The fact that the article was written as a warning to Europe and France in particular, makes its arguments the more potent. In a general sense it is quite in line with a letter from Paris in the Motor Age of December 21 on the motor industry in France.

Beginning with the invasion of Europe by Asia, and America by Europe, Mr. Weulersse sees the completion of the cycle of conquest in the present operations in the East Indies, and, further, shows that it is not merely an example of "westward the course of empire takes its way," for he cites the counter current of American conquest—commercial conquest—eastward and shows that America not only furnishes Europe and Asia with an enormous surplus of agricultural supplies, but, even at the present time, exports more manufactured goods than she imports.

He argues correctly that the war with Spain was never instituted as a war of

conquest, per se, but was a result of commercial expansion, rather than an initial attempt at military expansion. He analyzes the instincts of liberty that are inherent in the American people, more than in other peoples. He then characterizes America as the leading protestant country of the world and attributes much of the commercial expansion of the nation to the fact that protestant ministers have blazed the way for commercial expansion.

After arguing that American ambition will be realized, he characterizes that ambition in the following language:

To be the arbitress of the world, arbitress strong and feared, pacific arbitress—this is the dream of American ambition; this more than a dream of conquest. It may be permitted to be said that some of the immediate consequences of the war may give illusions as to the veritable character of American expansion. Americans do not dream of constituting in the proper sense of the word a colonial empire. Their solemn declarations—their constitution itself—seem to oblige them to either accord independence to Cuba or admit it into the union. As for the Philippines, bloody as is the war with the Tagals, their principles oblige a certain prudence, and council them to accord to the inhabitants of the archipelago a large autonomy. One must not forget that the senate, eight days after having ratified the treaty of Paris, voted the proposition of Senator McEnery, by which the United States declared its express intention was not to annex the Philippines, but to establish there a government which would conform to the needs and the conditions of the natives to prepare them for self-government.

After declaring that the aim of America is not for militarism, Mr. Weulersse says:

If American sentiment is against militarism, it is not only because of a love of peace in itself, but because peace is essential to commerce more than to be arbitrators. Americans have the ambition to be the great merchants, even more than by the humane and Christian mission they feel called upon by the commercial mission. Here we touch upon the final part of this preliminary analysis of the origin of the American expansion. American expansion is not an expansion of conquests; it is in a certain sense an expansion of political and moral influence, but, above all, a commerce expansion—there is its real character.

This commercial expansion, the direct result and immediate consequence of industrial development of the country commenced, as I said, before the war; the day after we will see it it will extend over newer fields even those those opened up by the war, and its progress will be quite out of proportion with the new advantages the latest treaties assured America. The possession of Porto Rico and the protectorate of Cuba will doubtless fortify the influence of Americans in Central America, and make them the masters of the grand interoceanic route which tomorrow they will traverse. The Philippines will open a vast field of exploitation, which, with Hawaii, are an enormous aid in the development of Asiatic-American commerce. But the commercial expansion of the United States, surpassing the immensity of their territorial expansion, more universal, more assured, than their political influence—seems destined already to embarrass the world.

After dealing with figures showing the immensity of American agricultural exports and the rapid increase in exports of manufactured products and the decrease in imports of the latter, until the balance is considerably in favor of the exports, the author continues:

One can say at the present hour that revolution is operating in the economic equilibrium of the world. This important factor in the industrial world, the United States, has, I may say, changed sign. Yesterday it was the great client of foreign industry, today, as well as client, it is the concurrent.

This grand fact strikes one, and has also exalted the imagination of the American people, always wide awake in whatever concerns their affairs. I have before me a colored engraving of one of the celebrated American caricaturists, Judge. It is entitled "The Whittler for the World." Dressed in national colors, pantaloons white and red, sky blue plastrons decorated with stairs, air of a good fellow, Uncle Sam is seated on a mountain of coal and minerals. At his feet, pell mell, rails, shoes, machines of all kinds, bicycles, graphophones, automobiles. In his left hand he holds a locomotive, which, with his right hand, he is sculpturing with the aid of a little penknife. He whittles with as much nonchalance as if it was a bit of wood or an Indian chestnut. Around him is a narrow stream designating the Atlantic, and a small lake, indicating the Pacific. All the people of the world form a circle, offering him their requisitions, holding out their big money bags. All are there, Japanese, Chinese, Soudanese, Italians, French, Prussians. Behind Germany looks on with big eyes. Near John Bull, correct, but desolate, also asks for locomotives and bridges. Is such a caricature pure artistic fantasie? No, it is only an image of the reality.

The article then deals at length with facts and figures showing in what countries and in what particulars American commercial expansion has made itself felt. China and Japan are cited and Manilla is pointed out as the sure rival of Hongkong. The railroads of India roll on

American rails. Egypt has not been opened by European arms to European commerce but to America who has supplied, among other things, the locomotives and wagons. America with a population of 75,000,000 has more miles of railroads than Europe with her 350,000,000 population. The United States has furnished Russia the rails, trains, cannon and cruisers for the latter's commercial and military conquests. Turkey is importing American goods and the sultan has asked the American government to send him professors to organize a college of agriculture. Austria and France are tributary to America and as to England, the savant says:

To accomplish the demonstration of his universal supremacy, Uncle Sam had only to give this recent lesson to John Bull at home. In the first months of the year astonishing news was discussed in English industrial circles. Two great English railway companies—the Midland and the Great Northern—ordered from the Baldwin shops at Philadelphia twenty locomotives at a time. Seventy years before the first locomotive that traveled in America was sent piece by piece from the Stephenson shops to Philadelphia.

But it is not only locomotives that Americans send to England. In April a great load of American machinery was sent to Sheffield. Yesterday Sheffield was the steel king; today it is dethroned by Pittsburg. In November, last year, a great bicycle manufacturer in England declared the best manufacturers buy their machinery in America. Not contented with sending to England steel plates, rails, locomotives, machines of all sorts, paper for newspapers, the Americans now send their coal to the countries where until recently the English coal was quite without rivalry.

Last May a great machine shop for naval constructions of Sunderland ordered in Pennsylvania the new American governor models.

All over England the cry of alarm was raised. The country felt itself menaced, already vanquished in industrial supremacy. Hardly a day passes but what one notes in the English press an article upon the victory of the American concurrence. The situation is such, said the Times last April, that English manufacturers ask themselves if American concurrence will regulate prices in England, and if it was worth while to struggle against a concurrence which troubled every one's mind. And English manufacturers, beaten by the Americans, fell back upon the government, which it accused of having failed to protect them, and demanded governmental aid to defend English industrial interests.

After giving the causes, the change in vessel construction that succeeded the civil war, that left America behind in the oceanic carrying trade, the Frenchman says:

But today naval construction is a great metallic industry. The masters of iron and steel, who are the Americans, excel in it. Without warning, in a stroke in 1898 the figure of naval constructions in America rose in the proportion of one to four, and since 1898 we have seen great English constructors obliged to borrow from the American constructors. The recent war gave the signal for the rebirth of the American marine, the results of the war have precipitated the development. The United States possesses, with its great fronts upon the two oceans, a unique position. With the possession or protectorate of Cuba and Porto Rico, the control of the interoceanic canal, with Hawaii and the Philippines, the United States cannot content itself with being a great continental nation. It will be before long one of the first, if not the first, maritime power.

After reviewing the financial situation, recognizing American independence of Europe and predicting financial supremacy for the future, the article summarizes by giving a paragraph of warning as to the danger that Europe has to face and continues with the reasons that lead to the present position of America:

Here today rises a new commercial empire almost without exterior possessions, but of which the founders are really the most numerous of civilized people, of which the center is half a continent, bathed for thousands of miles by two oceans, and which seems destined to embrace in a greater proportion than ever before the largest part of the economic world.

What are the advantages which assure the United States with its economic superiority, its commercial expansion? It seems to me they are two kinds, natural advantages and human advantages.

The natural advantages of a country are advantages of position and structure of constitution. The advantages of the position of the United States may be assumed by the fact that, situated in the temperate zone of the Northern Hemisphere, where nearly all the great civilizations have developed, it covers a large enough zone to include nearly every climate. Situated between two oceans, opening widely upon both, it is rela-

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tively within reach of the two great centers of population—western Europe and eastern Asia.

The United States has the advantage to possess, with large surface, a simple relief which the disposition upon the borders of the continent is favorable to a great variety of coasts and the establishment of good ports, while the grand plains which open in the center permit the development of one of the greatest streams of river navigation and lake navigation in the world.

But the most decided natural advantage the United States enjoys is that it still possesses vast plains of virgin fertile soil, acres of coal lands and mining lands, copper, iron, and silver and gold, as abundant as it is easy to exploit. If the Americans had not possessed the cheapest coal in the world we would not have seen in twenty years their importation of iron and steel, raw or manufactured, tumble from $70,000,000 to $12,000,000, and their exportation, the reverse, mount from $12,000,000 to $70,000,000. If they had not this bread of industry so cheap the American industrial men could not offer the galvanized wires at twenty to 100 below the price of English manufacturers. At the other end of the world they could not furnish rails to the transmanchurians at prices beyond comparison with those of the Russians and twenty to 100 below the lowest prices of other European manufactories. Whatever may be the natural advantages which I only indicate, they would not be sufficient to assume the economic superiority of the United States if the Americans did not possess in themselves decided advantages.

Why do so many merchants, so many industrial men of Japan, Cape Colony, Russia and England prefer to address themselves to American manufacturers instead of those of neighboring countries? It is not only because the Americans furnish better and cheaper, but also quicker.

The rapidity of production in the feverish state of contemporaneous industry is an advantage almost as important as the low price itself. Why did the Americans get the Atbara bridge contract? Because an American firm agreed to construct it in seven weeks, and the English constructors asked seven months, and the British government needed the bridge to facilitate the movements of Kitchener. Why did the Baldwin works at Philadelphia, which recently furnished the engines to the Great Northern in England, get the order? Because Baldwin offered to fill the contracts in four months. English houses asked eighteen.

The same causes gave America the extraordinary Sheffield machinery orders.

With all this, American furnishers are supple and docile. Here is a characteristic. The rails and tubes of the Cape Colony order had to be of a particular length. The Scotch manufacturers refused to make them; so the Americans made no difficulty.

The American industry has a mechanical superiority. Without that, American machines themselves would not form such an important part of the exportations. If the enormous American locomotives, with their 100,000 pounds, their eight or ten wheels, commence to conquer the world, it is because experience has proved that they are better and surer upon the rails at high speed and better accommodated to the irregularities of the line and irregularities of the ground.

If Russia orders her cannon in America it is because they are superior by their simplicity in design, light construction and facility of management and rapidity of firing.

This superiority of the American machinery is naturally manifest in the industrial products, in textile products, in metallurgic products. If Americans can sell their woolens and cottons, iron and steel, cheap, it is not only because they secure the raw material at low figures, but because they employ the maximum of perfected machinery and the minimum of labor. If they can deliver their products in a period three or four times shorter than their rivals, one of the principal reasons is the development of their installations.

Visit the great factories of America, take a tour through the immense workrooms, which are like deserts of machines. Measure these monsters of iron and steel, at the foot of which the body of an Anglo-Saxon seems that of an infant. This will give you a direct impression of the industrial superiority of America.

These are the immediate causes of the commercial expansion of the United States, but these great facts have even other causes. Americans possess natural mechanical genius. That spirit of comparison of practical measures which makes inventors and constructors the Americans possess to a high degree. An American knows how to calculate horse-power, steam horse-power, volts, amperes, as well as dollars. Often he is not strong in pure science, but science with him is at once translated into application, like their application in affairs.

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It is not only the machine but the mechanical spirit which reigns master in American workshops. Take as an example the furniture manufacturer. One never sees an American workman—as one sees a French workman—work alone on an entire piece of furniture, and go from one piece to another. In America work is rigorously divided. Each one works at his piece without knowing anything about the whole in which it will form a part. Upon his precision in following measures given him depends the final adjustment

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of the whole. Little is left to the artistic sense of the workman. Each piece arrives upon the minute in the assembling room, and the piece of furniture adjusts like a machine.

The author then takes up the relations of master and workman, commends those relations, eulogizing the piece-work system, tells of the superior intelligence of American workmen over Europeans and characterizes American energy as contagious and irrepressible. Continuing he says:

Freed from all bounds, with the strength of all its organs, the commercial empire of the United States can exercise without contest a real domination over the economic world. No one can now conquer the world, said a Yale professor recently. Charlemagne and Napoleon tried it, and failed, but it is not an American Napoleon or Charlemagne that the world fears, not the volunteers of Kansas or Nebraska, that London, Hamburg and Paris dread, nor even the cannons of Dewey. What they fear is the pacific invasion of this cheap, excellent merchandise from America, which will close up factories, ruin banks, and cause the workman to die of hunger.

The American peril exists; it is at our doors. If the American exportations to Europe continue to increase and those of Europe to America to diminish it is certain our industries will be ruined, our workmen reduced to misery. How can Europe defend itself? By protection. We must close our doors, decree against America a continental blockage of Europe. This is the first thought, but is it the best solution? To save Europe from ruin, should we destroy the work of Columbus, break relations with the new world, and make the Atlantic a desert? Would America hesitate to make a war with Europe to save herself? She could at least attack our colonies. Could we do without America? Where would Europe find her supplement of necessary cereals? To avoid ruin should we risk a deficit? Europe would be condemned to pay more than the price of products now. Behind a Chinese wall of protection Europe would go to sleep commercially.

Mr. Weulersse outlines the method by which Europe may defeat commercial supremacy as follows:

That is not the solution. The European production must diminish its expenses of production. Before long an attempt will be made to cut workmen's salaries; their complaints will bring about national intervention. Such an industrial policy would result in a violent social revolution, which would only degrade European industry. To defend ourselves against the Americans let us imitate them. Let us develop the mechanical spirit, concentrate our industries, unite our capital. By wise economic policy we might unite European industry. We must multiply our instruction, our professional schools, better our consular service, give better wages to our workmen, reduce the hours of labor. We could, by paying our workmen, save them from the American fever, by wise reforms avoid the social catastrophes which menace us. We could not rival the Americans in all their industries, but we might equal them in many.

The Americans do not exclusively want to sell; they want to buy. They do not care to lay up gold in coffers; the American likes to spend. Let us have something to offer. We now sell the Americans 100 or 200 millions of dollars less than they sell us, in Europe. The charms of our cathedrals, even our titled men are insufficient to offer as a balance.

To face the American economic expansion it is of vital necessity for Europe not only to better general conditions of production, but to transform the nature of the productions—to restrain it in the domains where American superiority is incontestable and to increase it where chances are equal, to develop it where there are certain advantages or where there is a chance for an increase in the demand. At the hour when an economic unity of the world is being established a division of work should be accomplished among nations. The crisis is grave, but should be discussed in harmony. The American products can cover the world, but they cannot soon cover the varied circle—infinite as the wants of man of the human production. In the great work of humanity to sustain itself, to multiply, to elevate itself, America gives Europe her part. It is for Europe, by a wise economy of her forces, by intelligently employing her qualities, to know how to keep the part given her.

In giving the remedy for the feared supremacy of America, the Frenchman indicates the points which have given and are giving us that supremacy and at the same time shows the necessity, not only of keeping up our present system but of enlarging it in the fields which it already occupies and of increasing it to compass new fields. There are particulars in which we are lacking. Our consular system is good but far from as good as it might be. In many respects both the British and the German, particularly the latter, are superior in matters that look to the commercial advancement of their countries.

NEWS OF THE TRADE

DETROIT AUTOMOBILE CO.

Detroit, Jan. 7.—The Detroit Automobile Co., has about completed a delivery wagon for the use of one of the largest stores in this city, and expects to have it running in the course of a few days. It follows the general lines of vehicles of this class except in the frame construction which differs materially in some respects. These differences will be dealt with at a later time, as at present the company can not give out particulars of this feature.

The motor used is of the double cylinder type, balanced, and drives the rear axle by a train of spur gears, the driving being done directly on the spur surrounding the differential. The steering is accomplished in the ordinary manner while the speed changes, starting, the vehicle, stopping, reversing, and starting the engine while in the carriage, is all done with one lever placed conveniently at the right hand of the operator.

The company also has a small carriage for the use of the members, which is fitted with a three-horse power motor of the same type as that in the delivery wagon, which vehicle has been put to some severe road tests in the last year. One of these was the covering of thirty-five miles of soft, muddy road outside of Detroit in two hours, the rig carrying two persons. The same vehicle has attained a speed on good roads, of twenty-seven miles an hour. As it was not built for racing purposes, however, it is seldom called upon to do more than twelve or fourteen miles in the hour as the city regulations will not allow high speeds on the streets.

The company is working a fairly large force of men on the carriages now in hand, but expect to greatly increase the force in the course of the next few weeks, as work is to be started on a larger scale shortly.

Manager Alderman stated to a representative of the Motor Age that it was the company's intention not to sell a vehicle until they were positive from the results of practical tests that their product was reliable and trustworthy in every respect. He realizes the injury being done by many who are placing vehicles on the market, that, although they are handsomely finished, are not successful mechanically. Such instances as these work great damage to the industry.

The policy has been to first get a successful machine, then make it as fine in every respect as possible and to ask a price that is equitable. Orders have been received during past months for large numbers of vehicles, but one and all have been refused because the company was not ready to deliver a vehicle practical in all respects.

The line to be manufactured consists of a surrey with or without top, a feature of which will be the arrangement of the seats, the rear one being some inches above the front, enabling the passengers in the rear to see over the heads of those in front.

Another vehicle that will play an important part in the line will be the physician's stanhope which will be fitted up in the handsomest possible style. One of these vehicles is now in process of manufacture and will be completed in the course of a few weeks. It is to be provided with every convenience for the carrying of a physician's cases and supplies, as well as being provided with top and coverings to entirely shut out bad weather.

A trap, phaeton, touring cart and runabout will conclude the line, samples of all of which will soon be ready to show. Work will be pushed rapidly from now on, as the company has passed the experimenting stage in its work and has secured a successful motor in which good combustion, a minimum amount of vibration, little noise and no odor to speak of is the combined result. It is economical in operation and sufficiently powerful for all the work it is intended to perform. The company has learned through its experiments that a successful carriage must be provided with a motor with power in

excess of that ordinarily needed, and has taken the precaution to construct their motors powerful enough to fill requirements, the regular motor, they claim, being five horse power, actual. The purchaser is safe in knowing he will not be stalled by small grades, sandy roads and heavy loads, as is the case with some styles of vehicles now being placed before the public which are fitted with altogether too light motors for the work they are expected to do.

NEW "AMERICAN" COMPANY

The American Electric Vehicle Co., which recently abandoned its Chicago quarters, has been reincorporated under New Jersey laws for $5,000,000. C. E. Corrigan occupies the position of vice-president and general manager in the new company, the same as he did in the old one, which has been absorbed, but the other officers are different. J. Herbert Ballentine of Newark is president, and George Lister of Trenton is secretary. A large factory has been secured in Hoboken at Third and Clinton Streets.

TRADE NOTES

Ellory A. Baldwin of West Upton, Mass., intends to begin manufacturing his self-adjusting bicycle and automobile chain at 535 Main Street, Worcester at once. He has received an order from a Boston automobile firm, soon to begin manufacturing wagons, and the order is for all that can be turned out. Mr. Baldwin has formed a partnership with A. J. Hendrick of the Hendrick Cycle Co., 5335 Main Street, Worcester, and chain machinery of special pattern is being put in place for the making of chains. The machinery will give a capacity of forty chains a day, but this will be enlarged. The automobile firm desires Mr. Baldwin to make the sprockets, which will be of special pattern suited to motor work.

Mr. Crompton, of the recently formed Crompton Automobile Co., of Worcester, Mass., has been making extensive experiments with various machines having built one of his own, and is now at work upon another. Mr. Crompton believes he is near to an automobile excelling in the requirements generally lacking in the present wagons, but is very secretive. George H. Kimbal, for the past few years in the office of the Washburn & Moen Mfg. Co., has resigned to enter Mr. Crompton's employ as confidential man. Mr. Crompton's experiments are being conducted in the Crompton department of the Crompton & Knowles loom works on Green Street, Worcester, where he has fitted up an experiment room.

Local cycle agents are, almost without exception, endeavoring to secure the Philadelphia agency for some one of the various standard American and foreign makes of motor cycles and automobiles with which the market will within the coming year be supplied. At present the makers find it practically impossible to meet the demand, and in almost every instance sales are made direct. Until this state of affairs can be remedied it is apparent that the manufacturers will not curtail their profits by paying agents' commissions.

The American Electric Appliance Co., with $100,000 authorized stock and the Automobile Repair & Storage Co., with an authorized capital of $50,000 have been licensed in New Jersey.

Charles F. Duryea is preparing to build a racing machine to take part in the speed competitions to be held in connection with the Paris exposition the coming summer.

It is reported that Col. Robert Fort, Illinois state senator from Lacon, is planning to engage in the manufacture of steam driven motor-vehicles.

On Saturday last the Philadelphia Pneumatic Tire Co. filed articles of incorporation in Camden. It is capitalized at $100,000, of which $1,000 is paid in.

A stock company has been organized in Minneapolis with an authorized capital of $800,000 by H. H. Thorpe.

Another Jersey corporation—the American Automobile Co., with an authorized capital of $6,000,000.

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MINOR NEWS AND COMMENT

CLEVELAND PARADE

The automobile is no new sight to Clevelanders, but few residents of this city have ever seen so large and varied an assortment of horseless carriages as composed the parade that wound its way through the city's streets last Monday, says the Cleveland Plaindealer.

Nearly every type of automobile, except the heavy truck, was in evidence, and all the motive powers were represented in one or more of the carriages. In spite of several minor accidents, the parade was a success and the crowds that shivered on the sidewalks as it passed on its way bore witness to the popular interest in the novel exhibition.

The horseless carriage has long since passed the experimental stage, and in the large cities is demonstrating its practical usefulness on a large scale. Millions of dollars are being invested in plants for its manufacture, and the new vehicle has obviously come to stay.

Some recent long distance records made by the automobile have excited lively interest and the coming international race, in which carriages from many countries will take part, will doubtless reveal new possibilities in the way of vehicles designed for road driving.

WANT MOTOR FIRE ENGINES

Philadelphia, Jan. 8.—An ordinance was introduced in the council on Thursday last directing the director of public safety to secure an estimate of the cost of equipping all the fire engines, hose carts and other vehicles connected with the fire department with some kind of motor, and providing that after April next no other than self-propelled vehicles be purchased by the department.

COMPARATIVE ACCIDENTS

The number of accidents due to the automobile, in common with accidents having any flavor of novelty connected with them, are sure to be heralded far and wide, giving the impression to the unthinking that such accidents are numerous. Paris Le Velo, to disprove this, has been to the pains of gathering statistics in Paris, where the auto is the most common, with the result that it has found that during December there were 708 accidents due to horses, resulting in the death of no less than fifty-two persons. In the same period there were twenty-one automobile accidents, resulting in no deaths.

COVER ILLUSTRATION

The cut on the front cover of this issue of the Motor Age represents the phaeton made by Humber & Co. (Extension), Ltd., of Beeston, Eng., and exhibited at the recent automobile and bicycle exhibition at Agricultural Hall, London.

The phaeton is fitted with a three horse-power horizontal gasoline engine with the combustion chamber in front where it is exposed to the fullest circulation of air. Power is transmitted from the crankshaft to a countershaft at the back of the rear axle by means of belts on fast and loose pulleys. The countershaft engages with the rear axle by means of a pinion which encircles the differential gear. The phaeton is started by means of a handle at the side, similar to the Bollee tricycles. A change of speed is effected by means of a foot lever which engages with either of the three notches, giving high and low speeds and out of action.

NOTES OF INTEREST

A. L. Riker, Alexander Winton and C. E. Woods have been named as the three representatives of America in the composition for the Gordon Bennett Cup in France the coming summer. The fact

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that two of the competitors will use electric vehicles, distinctively American products, will lend interest to the competition. One can not fail to regret, however, that America should not be represented by a steam vehicle as well as those driven by electricity and gasoline.

In an exhaustive, technical article on the balancing of motors by H. E. Wimperis in the London Automotor, the author demonstrates that the difficulties in balancing explosive motors are only structural, but adds that the structural difficulties are so great that it is practically impossible to entirely eliminate vibration. He leans to the idea that, ultimately, some sort of rotary engine will furnish the motive power for the best motor vehicles.

A suit for $10,000 damages has been filed by Miss Leah Garland against the Illinois Electric Vehicle Transportation Co., which she claims for alleged damages received while riding in one of the company's cabs last November.

Cleveland is about to join the ranks of the cities that support automobile clubs. E. G. Strong and L. H. Rogers are the leading spirits in its organization.

Reports from Philadelphia indicate that the action of motor-carriages and cabs in snowy and icy weather has been all that could be expected or asked.

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